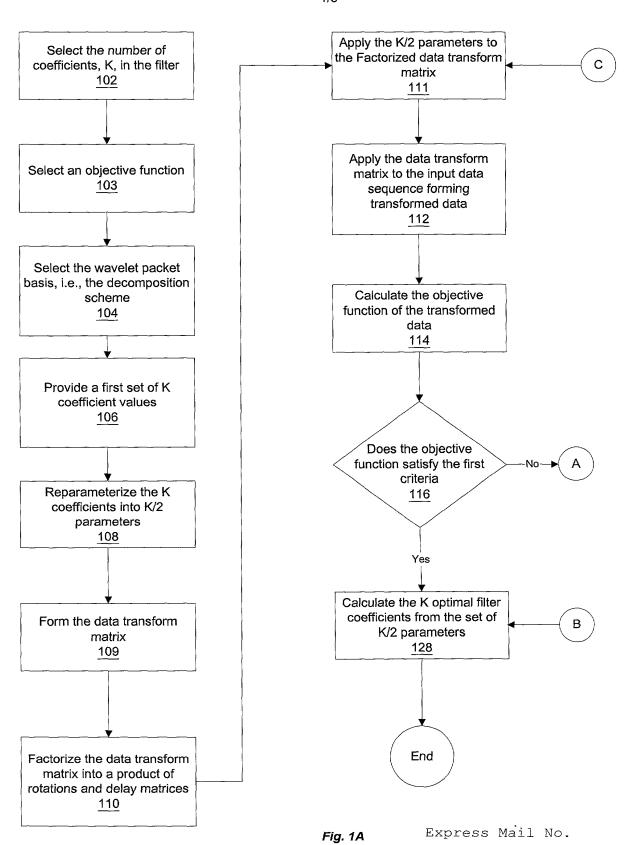Title: SIGNAL ADAPTIVE FILTER BANK
OPTIMIZATION
Inventors: Nicola Neretti, et al.
Appl. No.:____
Docket No.: MEDMT-001XX

1/5

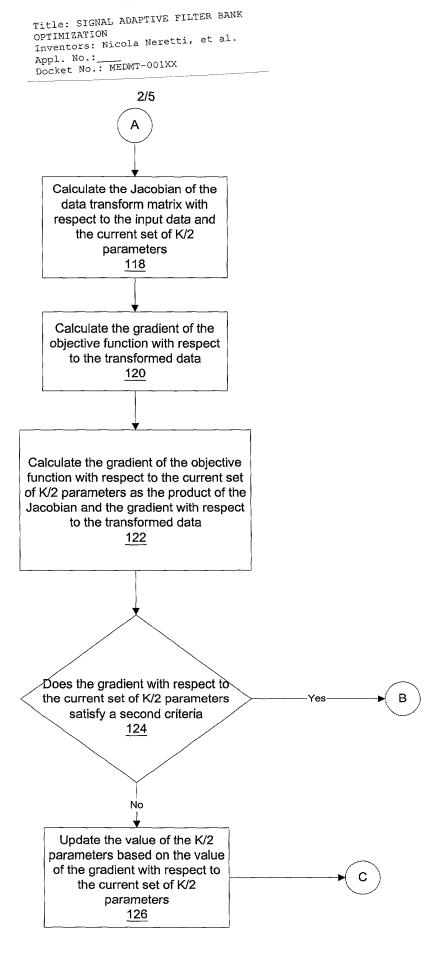Select the number of
coefficients, K, in the filter
102

Select an objective function
103

Select the wavelet packet
basis, i.e., the decomposition
scheme
104

Provide a first set of K
coefficient values
106

Reparameterize the K
coefficients into K/2
parameters
108

Form the data transform
matrix
109

Factorize the data transform
matrix into a product of
rotations and delay matrices
110

Apply the K/2 parameters to
the Factorized data transform
matrix
111

C

Apply the data transform
matrix to the input data
sequence forming
transformed data
112

Calculate the objective
function of the transformed
data
114

Does the objective
function satisfy the first
criteria
116

No → A

Yes

Calculate the K optimal filter
coefficients from the set of
K/2 parameters
128

B

End

Fig. 1A

(A)

Calculate the Jacobian of the
data transform matrix with
respect to the input data and
the current set of K/2
parameters
118

Calculate the gradient of the
objective function with respect
to the transformed data
120

Calculate the gradient of the objective
function with respect to the current set
of K/2 parameters as the product of the
Jacobian and the gradient with respect
to the transformed data
122

Does the gradient with respect to
the current set of K/2 parameters
satisfy a second criteria
124 ————Yes————▶ (B)

No

Update the value of the K/2
parameters based on the value
of the gradient with respect to
the current set of K/2
parameters
126 ————————▶ (C)

Fig. 1B

| x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 |

H   G
202

204   206

| s1 | s2 | s3 | s4 | d1 | d2 | d3 | d4 |

H   G   H   G

208   210   212   214

| ss1 | ss2 | ds1 | ds2 | sd1 | sd2 | dd1 | dd2 |

H   G   H   G   H   G   H   G

| x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 |

216   218   220   222   224   226   228   230

Fig. 2

Title: SIGNAL ADAPTIVE FILTER BANK
OPTIMIZATION
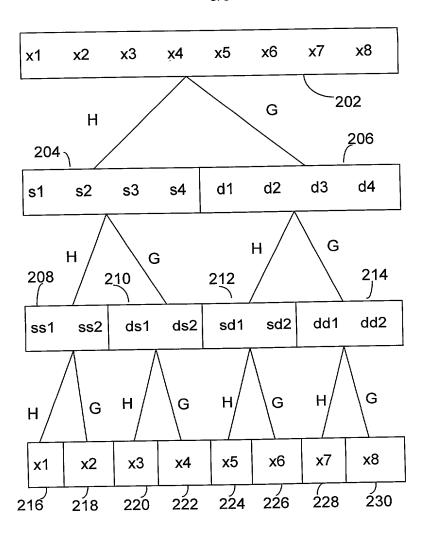Inventors: Nicola Neretti, et al.
Appl. No.:_____
Docket No.: MEDMT-001XX

4/5

300

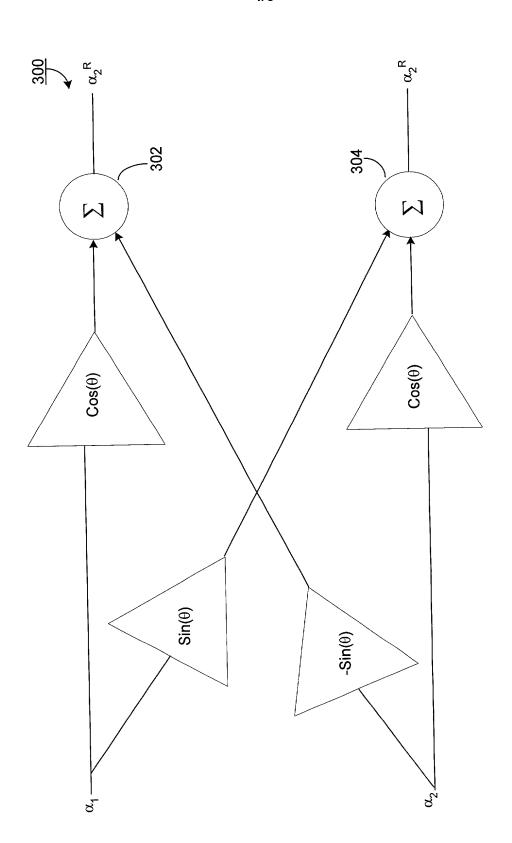α_2^R

302

Σ

$\text{Cos}(\theta)$

$\text{Sin}(\theta)$

α_1

α_2^R

304

Σ

$\text{Cos}(\theta)$

$-\text{Sin}(\theta)$

α_2

Fig. 3

Fig. 4